

# Evaluation of Posterior Lens Capsule and Anterior Hyaloid Membrane Using 20 MHz-Ultrasound Probe in Traumatic Cataract Cases

## Travmatik Kataraktlı Hastalarda Arka Lens Kapsülü ve Ön Hyaloid Membranın 20 MHz Ultrason Probu ile Değerlendirilmesi

Tuğba ÇETİNKAYA<sup>1</sup>, Nurşen ARITÜRK<sup>2</sup>

### ABSTRACT

**Purpose:** To compare preoperative 20 mHz ultrasonography (USG) findings and intraoperative evaluation of the integrity of posterior lens capsule and anterior hyaloid membrane.

**Materials and Methods:** The study include 51 eyes of 51 patients with traumatic cataract. All patients evaluated with 20 mHz USG preoperatively and scheduled to undergo cataract extraction. The 20 mHz USG scanning results were entitled as regular, defect and irregular. The intraoperative findings were entitled as regular, aperture with no vitreous and aperture with vitreous.

**Results:** The mean visual acuity of patients with a mean age of  $42 \pm 19$  years (range, 12-82) was  $2.3 \pm 0.7$  log MAR before the surgery. Twenty mHz USG showed regularity of posterior lens capsule in 27 patients (%53), irregularity in 21 patients (%41) and defect in three patients (%6). However, the intraoperative evaluation indicated regularity in 30 patients (%59), aperture with vitreous in 19 patients (%37) and aperture with no vitreous in two patients (%4). Comparison of the 20 mHz USG and intraoperative findings showed sensitivity, specificity, positive predictive value and negative predictive value of %100(100-100), %90 (79.2-100), %87.5 (74.2-100), and %100 (100-100), respectively. Coefficient of concordance between two methods was 0.853 (0.613-1.093) and observed proportion of agreement was 0.922.

**Conclusions:** In our study we indicated that both posterior lens capsule and anterior hyaloid membrane can be evaluated using 20 mHz USG scanning. Preoperative scanning with 20 mHz USG probe provides valuable informations especially in patients with traumatic cataract.

**Key Words:** Anterior hyaloid membrane, posterior lens capsule, traumatic cataract, ultrasonography, vitreous.

### ÖZ

**Amaç:** Arka lens kapsülü ve ön hyaloid membranın bütünlüğünün intraoperatif değerlendirmesi ile preoperatif 20 mHz ultrasonografi (USG) bulgularını karşılaştırmak.

**Gereç ve Yöntemler:** Çalışmaya travmatik kataraktlı 51 hastanın 51 gözü dahil edilmiştir. Tüm hastalar preoperatif olarak 20 mHz USG ile değerlendirilmiştir ve katarakt cerrahisi planlanmıştır. 20 mHz USG tarama sonuçları düzenli, defektif ve düzensiz olarak gruplandırılmıştır. İntraoperatif bulgular ise sağlam, vitresiz açıklık ve vitreli açıklık şeklinde gruplandırılmıştır.

**Bulgular:** Yaş ortalaması  $42 \pm 19$  (12-82 yaş) olan hastaların ortalama görme seviyesi cerrahi öncesi  $2,3 \pm 0,7$  log MAR'dı. Yirmi mHz USG 27 hastada (%53) arka lens kapsülünün düzenli olduğunu gösterdi, 21 hastada (%41) düzensizlik mevcuttu ve 3 hastada (%6) defekt vardı. Bununla birlikte, intraoperatif değerlendirme hastaların 30'unda (%59) arka lens kapsülünün sağlam, 19'unda (%37) vitreli açıklık ve 2'sinde (%4) vitresiz açıklık mevcuttu. 20 mHz USG ve intraoperatif bulgular karşılaştırıldığında sensitivite, spesifite, pozitif prediktif değer ve negatif prediktif değer sırasıyla %100 (100-100), %90 (79,2-100), %87,5 (74,2-100) ve %100 (100-100) olarak hesaplandı. Her iki metod arasındaki uyumluluk katsayısı 0,853 (0,613-1,093) ve gözlenen uyuşma oranı 0,922 olarak bulundu.

**Sonuç:** Çalışmamızda hem arka lens kapsülünün hem de ön hyaloid membranın 20 mHz USG taramasıkullanılarak değerlendirilebildiğini gösterdik. 20 mHz USG ile preoperatif tarama özellikle travmatik kataraktlı hastalarda değerli bilgiler sağlar.

**Anahtar Kelimeler:** Ön hyaloid membran, arka lens kapsülü, travmatik katarakt, ultrasonografi, vitreus.

1- Uzm. Dr., Ondokuzmayıs Üniversitesi, Tıp Fakültesi, Göz Hastalıkları, Samsun, Türkiye

2- Prof. Dr., Ondokuzmayıs Üniversitesi, Tıp Fakültesi, Göz Hastalıkları, Samsun, Türkiye

Geliş Tarihi - Received: 13.01.2017

Kabul Tarihi - Accepted: 19.09.2017

Glo-Kat 2018; 13: 7-10

Yazışma Adresi / Correspondence Address:

Tuğba ÇETİNKAYA  
Ondokuzmayıs Üniversitesi, Tıp Fakültesi, Göz Hastalıkları, Samsun, Türkiye

Phone: +90 362 312 1919

E-mail: mdtubacetinkaya@gmail.com

## INTRODUCTION

Blunt and penetrating trauma, electric shock or ionizing radiation can cause the traumatic cataract and decrease the visual acuity. In these cases, the additional problems may prevent to evaluate the position of the lens and the integrity of posterior lens capsule with biomicroscopic examination. 20 MHz USG was more effective to demonstrate the integrity of posterior lens capsule than that of 10 MHz and 50 MHz.<sup>1</sup> In this study we evaluated the integrity of posterior lens capsule and anterior hyaloid membrane in patients with traumatic cataract using 20 MHz USG preoperatively and determined the consistency between preoperative USG findings and intraoperative assessment.

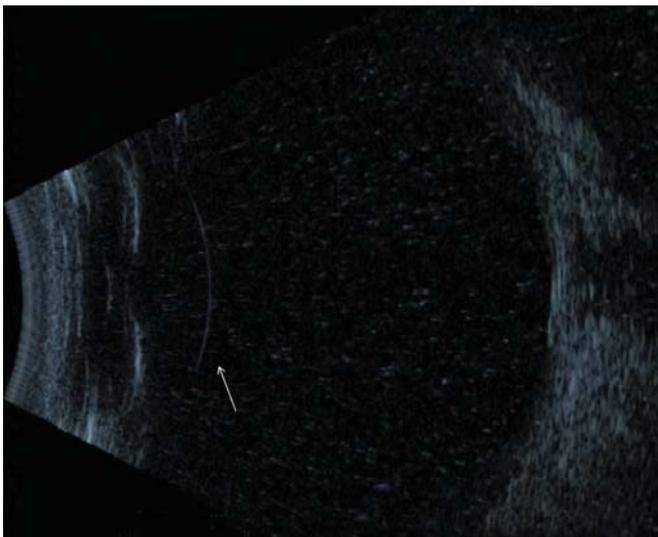
## MATERIALS AND METHODS

This study was approved by the Ethics Committee. This prospective study included 51 eyes of 51 patients with traumatic cataract who had penetrating or blunt trauma previously. In this study patients with open globe injury and irregular globe contour were not included into the study. Also patients younger than 18 years-old and patients with mental retardation were excluded because of the poor cooperation. All patients underwent a comprehensive ocular examination, including best corrected visual acuity, slit-lamp biomicroscopy, intraocular pressure measurement, indirect ophthalmoscopy and 20 MHz USG scanning (Quantel Medical, Aviso, France) for evaluating the posterior lens capsule and anterior hyaloid membrane. The USG scanning was done by experienced medical doctor. During the USG scanning patient lie down in supine position, a lid speculum was attached to the eye and a little gel was used for imaging. On the USG scanning if there was not any defect on the posterior lens capsule, we entitled this as regular (Figure 1). If the posterior lens capsule was seen commonly regular except a



**Figure 2.** The 20MHz USG shows a defect on the posterior lens capsule.

part, we entitled this as defect (Figure 2) and if it was not differentiated in no way or was seen commonly irregular, we entitled this as irregular (Figure 3). The cataract surgery was scheduled to all patients and done by experienced surgeon using the phacoemulsification method with anterior limbal approach. During the surgery the integrity of posterior lens capsule was evaluated and if the surgeon experienced suspicious puncturing, these patients were excluded from the study. On the intraoperative evaluation, if any aperture was not seen, it was called as regular, if a small gap was seen on the posterior lens capsule but the anterior hyaloid membrane was regular, it was called as aperture with no vitreous and if a gap on the posterior lens capsule was seen and anterior hyaloid membrane was irregular, it was called as aperture with vitreous. The reliability analysis was performed and the sensitivity, specificity, (+) and (-) predictive values were calculated. Coefficient of concordance between 20 MHz USG



**Figure 1.** The 20MHz USG shows that the posterior lens capsule is regular.



**Figure 3.** The 20MHz USG shows irregularity and aperture on the posterior lens capsule.

**Table.** The preoperative evaluation and intraoperative findings of the integrity of the posterior lens capsule.

		Intraoperative findings			
		Regular	Aperture with vitreous	Aperture with no vitreous	Total
Preoperative evaluation with using 20 mHz USG	Regular	27			27
	Irregular	3	18		21
	Defect		1	2	3
	Total	30	19	2	51

and intraoperative findings was calculated with the test of Kappa.

## RESULTS

This study included 51 eyes of 51 patients (8 women and 43 men) with a mean age of  $42 \pm 19$  years (range, 12-82 years). 65% of patients had history of operated penetrating trauma. The mean visual acuity was  $2.3 \pm 0.7$  (range, 0.1-3.1) log MAR before cataract surgery and the visual acuity of 88.2% of patients were less than 0.05. The findings of 20 mHz USG showed regularity of posterior lens capsule in 53% of patients, irregularity in 41% of patients and defect in 6% of patients. However, the intraoperative findings demonstrated regularity of posterior lens capsule in 59% of patients, an aperture with vitreous in 37% of patients and an aperture with no vitreous in 4% of patients. patients whose USG scans determined as defect were detected as aperture with no vitreous intraoperatively. And patients whose USG scans determined as irregular were detected as aperture with vitreous intraoperatively (Table). Comparison of the 20 mHz USG scanning and intraoperative findings showed sensitivity, specificity, positive predictive value and negative predictive value of 100% (100-100), %90 (79.2-100), 87.5% (74.2-100), and 100% (100-100), respectively. Coefficient of concordance between two methods was 0.853 (0.613-1.093) and observed proportion of agreement was 0.922.

## DISCUSSION

The eye trauma may results with lens injury, lens dislocation, corneal laceration, hyphema, fibrin exude, iridodialysis, angle recession, intraocular foreign body and vitreous hemorrhage.<sup>2,3</sup> Besides, these problems may complicate the cataract surgery. Preoperative evaluation of the integrity of the posterior lens capsule helps us to prevent the surgery complications and to choose the type of the lens that will be placed into the eye.<sup>2,4,5</sup> The ocular USG was first introduced in 1956.<sup>1</sup> USG is an acoustic wave with a frequency of greater than 20 kHz. The acoustic wave is reflected back to the transducer when it encounters with dense tissues. The dense tissues have high reflectivity and was seen as bright spots on the USG.<sup>1</sup>

The ocular USG has two basic forms including A scan and B scan imaging. A scan shows sectional image and measures the distances. It is usually used in the evaluation of axial diameter. B scan obtains two-dimensional image and has three types as 10 mHz, 20 mHz and 50 mHz scanning. 10 mHz and 20 mHz B scan imaging penetrates 45 mm depth and is useful to evaluate the posterior segment of the eye. It shows lens, vitreous hemorrhage, retinal detachment, choroidal injury, foreign body, vitreous pathologies, proliferative diabetic retinopathy and tractional retinal detachment. Nguyen et al. indicated that the best imaging of posterior lens capsule was obtained with 20mHz USG scanning. Also, 50 mHz B scan imaging penetrates 12 mm depth with 75 mm resolution and shows the lens and supported tissues.<sup>2,6-9</sup>

In this study, we demonstrated that if the USG images show a gap on the posterior lens capsule only at one point, it is generally associated with defect on the posterior lens capsule and regular anterior hyaloid membrane. However, if the USG images show a lot of gap on the posterior lens capsule or the posterior lens capsule doesn't differentiated in no way, it is generally associated with aperture with vitreous and irregular anterior hyaloid membrane.

We demonstrated strong correlation between preoperative USG scanning and intraoperative evaluation of the posterior lens capsule. In our knowledge there was no article about preoperative evaluation of anterior hyaloid membrane in patients with traumatic cataract. In our study we indicated that both posterior lens capsule and anterior hyaloid membrane can be evaluated using 20 mHz USG probe. According to these results, the preoperative assessment with 20 mHz USG provides valuable informations especially in patients with traumatic cataract.

## REFERENCES / KAYNAKLAR

1. Nguyen TN, Mansour M, Deschenes J et al. Visualization of posterior lens capsule integrity by 20 MHz Ultrasound Probe in Ocular Trauma. Am J Ophthalmol 2003; 136: 754-5.
2. Tabatabaei A, Kiarudi MY, Ghassemi F et al. Evaluation of posterior lens capsule by 20-MHz ultrasound probe in traumatic cataract. Am J Ophthalmol 2012; 153: 51-4.

3. Ozdal MP, Mansour M, Deschênes J. Ultrasound biomicroscopic evaluation of the traumatized eyes. *Eye (Lond)*. 2003; 17: 467-72.
4. Perry LJ. The evaluation of patients with traumatic cataracts by ultrasound Technologies. *Semin Ophthalmol*. 2012; 27: 121-4.
5. Rosen WJ, Campbell DG. Posterior capsule rupture after a paint-pellet injury. *J Cataract Refract Surg* 2000; 26: 1422-3.
6. Pavlin CJ, Harasiewicz K, Sherar MD et al. Clinical use of ultrasound biomicroscopy. *Ophthalmology* 1991; 98: 287-95.
7. Skalka HW. Ultrasonic diagnosis of posterior lens rupture. *Ophthalmic Surg*. 1977; 72-6.
8. Shi B, Chen W. Clinical significance of preoperative B-ultrasonography for traumatic cataract. *Zhonghua Yan Ke Za Zhi*. 1998; 34: 298-9.
9. Silverman RH. High-resolution ultrasound imaging of the eye- a review. *Clin Experiment Ophthalmol*. 2009; 37: 54-67.